5.3 Electric Field Strength

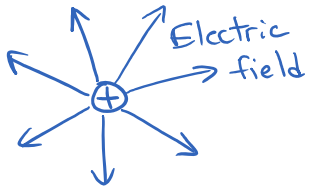
November 29, 2017 11:28 AM

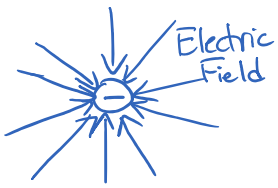
Force field - a model that helps us understand the idea of forces being transmitted across empty space.
(electric, magnetic, gravity $\vec{g} = \frac{\vec{F}}{m}$)

Electric Field - a region of space in which a charged object is acted on by a force exerted by a source charge (or parallel plates)

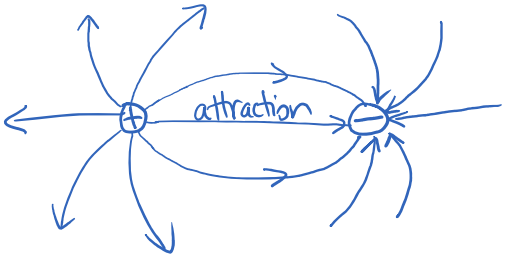
- drawn as a vector diagram from + to − or in the direction a tiny positive test charge would move.
- Faraday 1800's

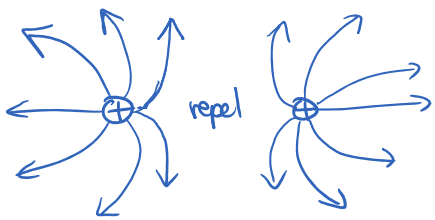
point charge

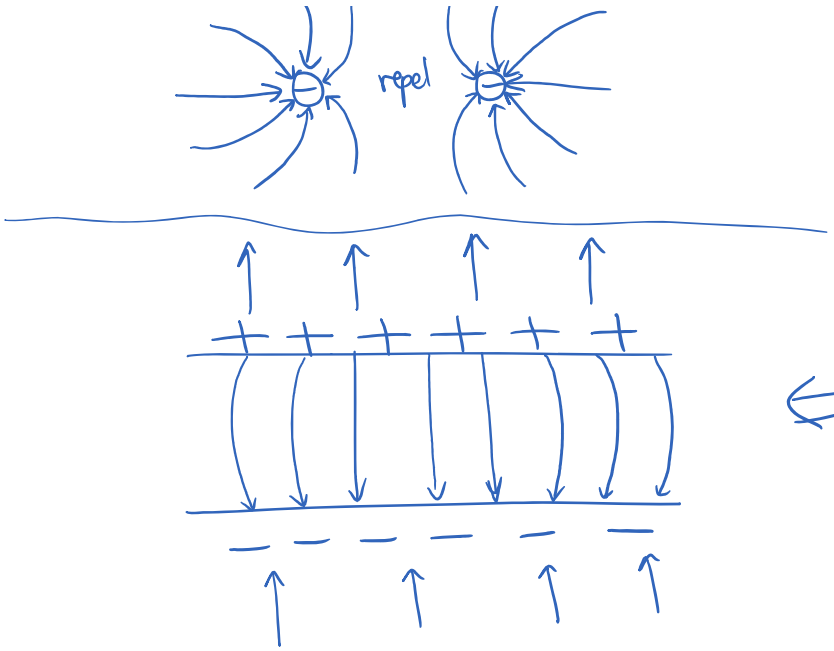




Notice- lines never cross
- meet surface of object at 90°
- closer lines = stronger field







parallel plates

⇐ focus on electric field between plates.

Formula for Electric Field Strength

$$\vec{E} = \frac{\vec{F}}{Q_t}$$

$\vec{F}$ ← Force felt by test charge

$[\frac{N}{C}]$

Q_t ← test charge

Can combine Coulomb's Law to be able to find $\vec{E}$ at a specific distance from a source charge

$$\vec{E} = \frac{\frac{KQ_sQ_t}{R^2}}{Q_t} = \vec{E} = \frac{KQ_s}{R^2}$$

Q_s ← source charge

R ← distance from source

Multiple Charges creating Electric Field

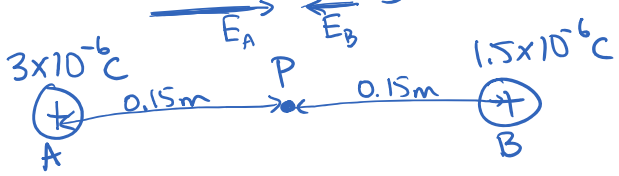
- must do vector sum of all fields acting at that point.

in line : use test charge to determine direction of fields then add or subtract

Ex pg 183 (my way)

$\vec{E}_A = \frac{KQ_A}{R^2} = 1.2 \times 10^6 N/C$ [Rt]

Ex pg 183 (my way)



$$\vec{E}_A = \frac{kQ_A}{R_A^2} = 1.2\times10^6 \text{ N/C } [Rt]$$

$$\vec{E}_B = \frac{kQ_B}{R_B^2} = 6.0\times10^5 \text{ N/C } [Lf]$$

$$\vec{E}_{\text{net at P}} = \vec{E}_A + \vec{E}_B$$

$$= 1.2\times10^6 [Rt] + 6\times10^5 [lf]$$

$$= 1.2\times10^6 [Rt] - 6\times10^5 [Rt]$$

$$= +6.0\times10^5 \frac{N}{C} [Rt]$$

Practice

pg 180 # 1-3
pg 181 # 1-3
pg 182 # 1-3